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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/002,576	10/26/2001	Changmin Chun	ECB-0115	4233
27810	7590	12/29/2004	EXAMINER	
EXXONMOBIL RESEARCH AND ENGINEERING COMPANY P.O. BOX 900 1545 ROUTE 22 EAST ANNANDALE, NJ 08801-0900			WILKINS III, HARRY D	
		ART UNIT	PAPER NUMBER	
		1742		
DATE MAILED: 12/29/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/002,576	CHUN ET AL.	
	Examiner Harry D Wilkins, III	Art Unit 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 01 December 2004.
- 2a) This action is FINAL.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1,2,6,7,10 and 11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1,2,6,7,10 and 11 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 26 October 2001 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |  |
|--|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                     | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)              |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date. _____. | 6) <input type="checkbox"/> Other: _____.  |

## **DETAILED ACTION**

1. This is in response to the Appeal Brief filed December 01, 2004.

In view of the arguments in the Appeal Brief, the finality of the last Office action is withdrawn.

2. However, new grounds of rejection are presented below based on a new interpretation of the claim language.

### ***Claim Interpretation***

3. The present claim recites the steps of "(a) heating an iron containing article comprising at least 50 wt% iron and in which the amount of carbon contained in the article is less than 0.77 wt% down to 0.0 wt% carbon for a time and at a temperature sufficient to convert at least a portion of said article from a ferritic structure to an austenitic structure" and "(b) exposing said austenitic structure, for a time sufficient and at a temperature of about 727 to about 900°C, to a carbon supersaturated CO/H<sub>2</sub> environment consisting essentially of Co and 10 to 50 vol% H<sub>2</sub>, and having a carbon activity greater than about 1, to diffuse carbon into said austenitic structure." There is no exclusion from having the heating step occur in the carbon supersaturated environment, and as such, a heating step for carburization in a temperature range sufficient to cause austenization would teach the simultaneous application of these two steps. Such a disclosure would read on the present claims.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramanarayanan et al (US 5,869,195) (henceforth "Raman") in view of Garg et al (US 6,287,393).

Raman teaches a method of forming a pearlitic surface layer on a steel article. Raman teaches (see col. 2, line 53 to col. 3, line 12) a process including starting with a steel article containing low amounts of carbon, carburizing the steel article and slow cooling of the steel article to form a surface layer of pearlitic structure. Raman discloses an example of carburizing conditions (>900°C in a CH<sub>4</sub> - H<sub>2</sub> atmosphere), however, this was only an example, and it is clear that any appropriate carburizing atmosphere would have been sufficient.

Thus, Raman meets step (c) of the present invention, but fails to teach the specific temperature and atmospheric conditions of the carburizing treatment as is presently claimed.

Garg et al teach (see col. 5, lines 24-46 and col. 9, lines 38-64) a method of carburizing steel that includes carburizing at 750-950°C with a carburizing atmosphere containing only CO and H<sub>2</sub> (along with trace amounts of other compounds). The atmosphere can contain as much as 50 vol% CO (where n=1 and m=0, both within the range of Garg et al), with no N<sub>2</sub> added, thus leaving the other 50 vol% to be essentially all H<sub>2</sub>. There would be some residual methane and/or CO<sub>2</sub> in the atmosphere, but not enough to effect the carburizing. Thus, the atmosphere composition taught by Garg et

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al consists essentially of CO and H<sub>2</sub>. Though Garg et al do not contain any express teachings regarding the saturation or carbon activity of the atmosphere, one of ordinary skill in the art would have expected that with the 50/50 CO/H<sub>2</sub> atmosphere, the carbon activity would have been increased, thereby creating a supersaturated environment, because more carbon in the atmosphere (higher carbon activity) increases the rate of carbon transfer to the iron and also increases the maximum carbon content of the iron (for support, see "Gas Carburizing"). Thus, Garg et al teach simultaneously applying a heating to [inherently] cause transformation of ferrite to austenite while exposing the formed austenite to the carbon supersaturated environment. Regarding the fact that the heating converts at least a portion of the ferritic structure to an austenitic structure, the temperature range disclosed by Garg et al was above the ferrite-austenite transition temperature of 727°C. Thus, the heating to the carburizing temperature inherently produced the claimed conversion of ferrite to austenite.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed the conventional carburizing process as taught by Garg et al as the carburizing treatment of Raman because the CO/H<sub>2</sub> environment of Garg et al was effective at quickly facilitating carbon transfer to the steel (see Garg et al at col. 7, lines 5-24).

Regarding the fact that Raman contain an additional step of forming an FeS surface layer on top of the pearlite, the present claims recite a process "comprising" a list of steps, and thus is interpreted to be left open to additional steps.

Regarding claim 2, Raman teaches (see col. 2, lines 49-52) that the preferred steels include 0.6-0.9 wt% Mn and 0.1-0.5 wt% Si.

6. Claims 6, 7, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Raman (US 5,869,195) in view of Garg et al (US 6,287,393) as applied to claims 1 and 2 above, and further in view of Kerridge (US 4,461,655).

The teachings of Raman in view of Garg et al are described above.

However, Raman in view of Garg et al do not teach that carburizing was applied for about 1 minute to about 50 hours. In fact, Raman is totally silent as to the duration of any carburization treatment.

Kerridge teaches (see col. 3, lines 22-27) that carburized depth was effected by total treatment time.

Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the duration of the carburizing treatment to produce a desired carburized surface layer, and as such, the desired pearlite surface layer.

Regarding claims 7, 10 and 11, Raman teaches (see col. 1, lines 41-42) that the thickness of the pearlitic surface layer was preferably at least 20 microns. As can be seen from Figs. 1B and 1C of Raman, the layer of pearlite was continuous. It would have been within the expected skill of a routineer in the art to have performed the carburization for a length of time sufficient to convert the entire iron article to pearlite.

### ***Response to Arguments***

7. Applicant's arguments with respect to claims 1, 2, 6, 7, 10 and 11 have been considered but are moot in view of the new ground(s) of rejection. .

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In addition, Applicant's arguments with respect to the timing of the heating and exposing steps are not found persuasive because there is no limitation stating that during the heating step the iron article was not excluded from being contacted by a carburizing atmosphere.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-Th 10am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Harry D Wilkins, III  
Examiner  
Art Unit 1742

hdw

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SUPERVISORY PATENT EXAMINER  
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